APPENDIX A - CHSSI Standards and Measures

Types and Categories of Measures

All measures related to the HPCMP derive from the program's mission and each initiative's place within the entire program. So from CHSSI's mission and goals evolve macro level technical and managerial standards which are then customized to CHSSI project management and to CHSSI projects.

Technical Standards

Measures of Effectiveness and Suitability (MOE&S)

Three overall technical Measures of Effectiveness and Suitability are derived from the purpose for which CHSSI was instituted. They are that the CHSSI software must achieve, through processor scalability, a quantifiable performance improvement over current systems; it must be portable across different HPC platforms; and it must be accurate. Thus, each project's software is evaluated during the development process at specified intervals and at the completion of development for:

Scalability: Each code must achieve scalable performance improvement over the current system or software.

Accuracy: Each code must produce accurate output.

Portability: Each product must port across different high performance computing platform architectures.

These "measures" are generalized and the terms must be expanded to develop more definitive criteria which will be later tailored to the goals of each project. The tailoring is done by developing Critical Technical Parameters for each project.

Critical Technical Parameters (CTPs)

The CTPs flow from the CHSSI MOE&Ss, and each project's own stated goals. You can see from a review of the table below that the CTP titles further define the more general MOE&Ss. They are "critical" because they are necessary for the project's software to perform as it was proposed to perform. They are "technical" because they apply to the code's performance. They are "parameters" because, once developed for each project they show both minimum (threshold) and optimum standards against which the software's performance is appraised.

No two codes are expected to have exactly the same CTPs; but all are expected to measure performance against all three MOE/MOSs (scalability, accuracy, and portability). The

Principal Investigator develops the thresholds that apply to each CTP category. CTA/Portfolio Leader and the SAS PM review and approve these thresholds. The table below describes what types of CTPs are included under each MOE&S and outlines a few observable performance improvements which can later be converted to quantifiable performance.

Table 1 - Critical Technical Parameters

MOE&S	CTP Title	Observable
MOE 1.4 **Software Performance** The CHSSI software is a scalable and stable product that provides accurate results to the user.	Scalability	- Speed to solution - Increased problem size
	Accuracy	- Valid, accurate results or output
MOE 2.1 **Compatibility** CHSSI will provide software that is portable.	Portability	- Readily work on different platforms

The CTP categories shown above are not all-inclusive and we expect the Project Principal Investigator to examine the project's technical requirements and develop Critical Technical Parameters that focus on the project's technical goals. The project's CTPs should be directly related to the project's unique and critical goals and track well with the project's proposal.

Critical Operational Issues (COIs)

In the form of questions whose answers will appraise the success of each project, these standards combine the MOE&S with DoD software development standards and good software development practices. The Joint Interoperability Test Command (JITC), an independent test agent, conducts a final appraisal of selected CHSSI projects and uses these questions, the projects' performance against project-specific CTPs, and user interviews or surveys to perform an Operational Test and Evaluation (OT&E) of the projects.

Table 2 - COIs for CHSSI Projects

HPCMP COI	CHSSI COI Title	CHSSI COI Description
COI 1 PERFORMANCE (Effectiveness). Do the HPCMP resources meet the DOD S&T and T&E user communities' requirements?	Performance	Does the CHSSI software project provide computational results that are accurate, stable, and reliable in a portable scalable environment?

HPCMP COI	CHSSI COI Title	CHSSI COI Description
COI 2 COMPATIBILITY AND INTEROPERABILITY (Effectiveness). Does the HPCMP provide the compatibility and interoperability required for sharing computational resources and mass storage facilities among local and remote users; as well as the capability to integrate with existing HPC and planned HPCMP assets across networks?	Compatibility and Interoperability	Does the software provide the compatibility and interoperability required?
COI 3 USABILITY (Suitability). Do the HPCMP resources support ease of learning, ease of use, effectiveness, efficiency, and user satisfaction?	Usability	Does the software support ease of learning, ease of use, effectiveness, efficiency, and user satisfaction?
COI 5 INFORMATION ASSURANCE (Effectiveness). Does the program protect its information, provide adequate system protection, and possess the ability to survive potential threat interference?	Information Assurance	Are appropriate access controls in place to safeguard the intellectual property rights and security concerns associated with the CHSSI software?

Managerial Standards

Project Management Indicators (PMIs)

PMIs flow from DoD directives and instructions, best practices, and the COIs. PMIs evaluate the project's process, interim performance, and the team's management of resources. They are used to assess the overall performance of the project leader, his or her team, and their ability to develop and follow reasonable and appropriate procedures for managing a software effort of the project's size and scope. These indicators are also considered in the Principal Investigator and team members' past performance evaluation for new project proposals. PMIs are grouped into three main headers:

- Project planning, tracking and oversight
- Requirements management/configuration control
- Quality assurance, technology transfer and user support

As you can see by the tables that follow PMIs also serve as minimum guidelines for the conduct of essential management activities throughout the life of the project and keep the team focused on the outcome of the development effort.

Table 3 - PMI 1: Project planning, tracking and oversight

Description	Comments/Notes	SAS PM Applicability	CTA/Portfolio Leader Applicability	Principal Investigator
PMI 1-1 Project documentation shows a clear connection among the development effort, CHSSI goals, HPCMP goals, war fighter applications, and possible returns on investment.	Description and objectives of project developed, approved and on file with CTA/Portfolio Leader and Software Applications Support (SAS) Project Manager (PM) showing innovative use of high performance computing (HPC) technology to solve critical military applications.	- Provides calls for project proposals, which are vetted with Service/Agency science and technology and test and evaluation principals and appropriate technical experts to ensure selected projects are technically feasible and in consonance with HPCMP goals and war fighter needs. - Provides guidelines and training to ensure project documentation is correct and sufficient for the project. - Establishes a document submission and cyclic review schedule. - Reviews all documentation. - Provides guidance and assistance to improve documentation and incorporate lessons learned. - Maintains documentation files on all projects and a record of compliance. - Evaluates performance against documentation.	- Provides consistent and coherent oversight of project documentation. - Reviews and edits all project documentation for compliance and technical correctness. - Provides guidance and assistance to improve documentation and incorporate lessons learned. - Establishes and maintains a suspense system to ensure documents are prepared, reviewed, improved and submitted as required. - Evaluates performance against documentation.	- Prepares, reviews, updates, and refines project documentation in accordance with guidelines and lessons learned. - Maintains document version control to ensure all changes are tracked and justified.

Description	Comments/Notes	SAS PM Applicability	CTA/Portfolio Leader Applicability	Principal Investigator
PMI 1-2 Comprehensive Software Development Plan (SDP) emphasizes best practices from standard software engineering principles developed, approved and on file with CTA/Portfolio Leader and SAS PM	The SDP is the keystone of the development effort. It outlines essential steps and team responsibilities to ensure a good product.	- Reviews and comments on all SDPs and changes thereto to ensure the SDPs are correct and sufficient for the project. - Appraises performance against SDPs. - Communicates current information on industry and CHSSI best practices, standards, news and lessons learned to improve the SDP and software development effort. - Requires formal annual review of the SDP.	- Reviews and comments on all SDPs and changes thereto to ensure the SDPs are correct and sufficient for the project. - Appraises performance against SDPs. - Communicates current information on industry and CHSSI best practices, standards, news and lessons learned to improve the SDP and software development effort. - Ensures the project plans to achieve appropriate compliance with industry standards such as POSIX Level 2 and Level 2 of the Software Capability Maturity Model. - Ensures formal annual submission and review of the SDP. - Formally reviews project SDPs at least annually in sufficient time to return the document to the Project Principal Investigator for correction prior to the SAS PM due date.	- Prepares, reviews, updates, and refines the SDP in accordance with guidelines and lessons learned. - Ensures the development team is fully aware of and consults the SDP. - Uses the SDP as a working document and frequently reviews it with team members for compliance, planning, and recommended refinements. - Provides a formally reviewed edition of the plan to the CTA/Portfolio Leader at least annually.

Description	Comments/Notes	SAS PM Applicability	CTA/Portfolio Leader Applicability	Principal Investigator
PMI 1-3 Project milestones, financial data and metrics approved, tracked and reported regularly to SAS PM.	Monthly and quarterly reporting requirements are outlined in the Terms of Reference (TOR), which effects funds transfers to the CTA/ Portfolio Leader, and/or Project Principal Investigator. The TOR is a type of contractual document that outlines why funds are provided and what the receiver must do in return. In addition to the actual software development effort, the TOR obligates the receiving party to provide recurring data such as monthly financial reports and documents and quarterly progress reports.	- Updates and finalizes the text of TORS and provides the HPCMP financial manager with technical and financial contact information. - Provides templates and guidance concerning quarterly reporting requirements. - Reviews monthly financial and quarterly progress reports and provides feedback as appropriate. - Maintains files on all projects and a record of compliance. - Monitors compliance and evaluates compliance performance.	- Manages financial and technical reporting requirements for all subordinate projects. - Ensures funds are committed, obligated/deobligated, expended, or returned to the HPCMP in accordance with appropriate regulations and HPCMP instructions. - Ensures financial data and documents and quarterly reports are complete and accurate and furnished to the HPCMP on time. - Provides guidance and lessons learned to subordinate Project Principal Investigators.	- Complies with reporting requirements.

Description	Comments/Notes	SAS PM Applicability	CTA/Portfolio Leader Applicability	Principal Investigator
PMI 1-4 Principal project team members and organizational responsibilities are determined and provided to CTA/Portfolio Leader and SAS PM	Work Breakdown Structure (WBS) is a required part of the SDP. Project teams should emphasize multi-service requirements and teaming wherever possible and interact with other federal agencies when feasible.	- Ensures WBS is a required part of the SDP. - Monitors WBS items with each SDP review. - Provides comment/ feedback as deemed appropriate. - Provides guidance to project leadership (CTA/Portfolio Leaders and Project Principal Investigators) to foster clear lines of responsibility and increased cogent communication to ameliorate the negative effects of team organizational diversity.	- Ensures a realistic WBS is developed and recorded in the SDP. - Monitors WBS items with each SDP review. - Monitors team progress and communications. - Provides guidance as deemed appropriate.	- Manages team performance and communication. - Reviews, refines and updates the WBS when reviewing the SDP.
PMI 1-5 Project progress reviewed by CTA/Portfolio Leader at least quarterly and reviewed by independent team and/or SAS PM at least annually	From past experience, we see that pro-active, involved management is essential to reduce project risk. Regular review of technical progress and PMIs will help redirect faltering efforts early on or terminate those who are high risk for successful completion.	- Establishes and maintains a process to review project PMI compliance and technical progress. - Monitors CTA/Portfolio Leader reviews of project progress. - Takes remedial action as necessary. - Reviews and documents PMI and technical progress at least annually and provides report to the Director HPCMP.	- Establishes and maintains a process to review project PMI compliance and technical progress. - Monitors CTA/Portfolio Leader reviews of project progress. - Reviews PMI and technical progress at least quarterly. - Takes remedial action as necessary. - Provides quarterly report to the SAS PM on time.	- Monitors development team progress and takes remedial action as necessary. - Ensures compliance with SDP and associated contracts. - Provides progress and remediation reports to the CTA/Portfolio Leader as required.

Table 4 - PMI 2: Requirements management/configuration control

Description	Comments/Notes	SAS PM Applicability	CTA/Portfolio Leader Applicability	Principal Investigator
PMI 2-1 Requirements, input, review, approval/rejection and feedback process developed and known by team and user community	Project should make multiple media options available for input of requirements and feedback (Web, e-mail, fax, phone, etc). It is important for CTA/Portfolio Leaders and Project Principal Investigators to identify the full user community and to solicit and use feedback from as wide a user community as possible.	- Provides guidance concerning the establishment of a requirements process and use of user community feedback.	- Encourages and assists in identifying and soliciting users, their requirements, and their feedback from the DoD Services and Agencies as well as the full federal high performance computing community. - Approves and monitors the requirements solicitation, review and feedback process.	- Identifies the full federal prospective user community. - Solicits requirements and input as appropriate. - Provides timely feedback.

Description	Comments/Notes	SAS PM Applicability	CTA/Portfolio Leader Applicability	Principal Investigator
PMI 2-2 Multi-level software testing, error fixes, lessons learned and validation/ verification methods, schedules and results documented and made available to user community, CTA/Portfolio Leader and SAS PM	Projects should make multiple media options available for error reporting and release notification during beta development and after fielding.	- Provides guidance and fosters good software development practices. - Establishes policy concerning post development maintenance of code. - Monitors compliance and evaluates compliance performance at the CTA/ portfolio level during cyclic technical reviews. - Considers post-development compliance of Project Principal Investigators in past performance evaluations of new projects.	- Provides guidance and advice and fosters good software development practices. - Monitors software development practices. - Monitors compliance and evaluates compliance performance at the CTA/ portfolio level during cyclic technical reviews. - Considers post-development compliance of Project Principal Investigators in past performance evaluations of new projects.	- Manages error identification, fix and testing procedures and oversees compliance. - Establishes systematic procedures to keep the team and users aware of same. - Maintains good software development practices after initial development. - Promulgates fixes as appropriate.
PMI 2-3 Project team members maintain regular contact with one another and Project Leader reviews progress and lessons learned routinely	Project Leader is also expected to keep his/her management chain informed of progress and issues as they arise.	- Provides guidance and fosters good communication practices.	- Provides guidance and advice and fosters good communication practices. - Monitors communication practices.	- Establishes regular meetings with the development team to review requirements, schedules and progress and to identify problems. - Regularly briefs CTA/Portfolio Leader and management chain.

Table 5 - PMI 3: Quality assurance, technology transfer and user support

Description	Comments/Notes	SAS PM Applicability	CTA/Portfolio Leader Applicability	Principal Investigator
PMI 3-1 Comprehensive technical reference/ users' manuals and lessons learned repository developed and maintained current	Manuals and lessons learned repositories have been a weak point for CHSSI projects. Projects are selected based upon user requirements and DOD impact; therefore we cannot allow the code developed to be exclusively for the Project Principal Investigator and his/her research, development, test and evaluation (RDT&E) team. Nor should users have to consult the development team or its remnants for routine questions and procedures. Software documentation should show clear modular design using standard languages, tools, interfaces, commercial off-the-shelf (COTS), etc., for maximum interoperability, reusability, ease of use and maintainability.	- Establishes policy and procedures for the development, update, publication, and review of appropriate manuals and lessons learned repositories. - Monitors compliance and evaluates compliance performance.	- Reviews manuals and lessons learned repositories and provides comments and feedback. - Monitors compliance and evaluates compliance performance.	- Prepares, refines, and updates manuals. - Develops, publishes, and keeps current a lessons learned repository. - Solicits and incorporates recommended changes and improvements. - Provides authorized users with necessary documentation and scripts as well as appropriate portions of the lessons learned repository.

Description	Comments/Notes	SAS PM Applicability	CTA/Portfolio Leader Applicability	Principal Investigator
PMI 3-2 User assistance provided as required and available and training program developed and maintained current	Provides sufficient training materials for the user community. Feedback from user community obtained on quality and ease of manuals, lessons learned repository and training	- Establishes policy and procedures for the conduct of user assistance. - Provides guidance for the establishment and maintenance of user assistance resources. - Provides guidance for the establishment of training programs. - Monitors compliance and evaluates compliance performance.	- Facilitates the establishment and conduct of user assistance operations. - Assists in the development and conduct of training programs. - Monitors compliance and evaluates compliance performance.	- Prepares, refines, updates, and promulgates user information and and training materials. - Obtains feedback from the user community concerning the assistance/ information provided..

Description	Comments/Notes	SAS PM Applicability	CTA/Portfolio Leader Applicability	Principal Investigator
PMI 3-3 User access and responsibilities, project sensitivities and security policies, procedures, and requirements documented, maintained and advertised to hosting shared resource centers and the user community and made available to CTA/Portfolio Leader and SAS PM	SAS PM provides basic OSD guidance concerning distribution statements and export control determinations. The Service, Agency or organization determines and implements local policies and physical and system security requirements for the code and associated data.	- Establishes policy and provides guidance for the identification of code security issues. - Monitors compliance with policy.	- Assists in the identification of code security issues. - Monitors compliance with policy.	- Works with supervisor, local security personnel, and the CTA/Portfolio Leader to determine and enforce export control and security restrictions early development process and validates such restrictions as the software capability develops and export control and security guidance changes. - Ensures hosting shared resource center systems administration staff are aware of restrictions to the code and affiliated data.

Description	Comments/Notes	SAS PM Applicability	CTA/Portfolio Leader Applicability	Principal Investigator
PMI 3-4 Project files are kept current with all required and historical data and information, and are reviewed regularly by CTA/Portfolio Leader	Once developed, we expect that the codes will undergo additional refinements. Good software development practices, therefore, should continue after fielding.	- Establishes policy concerning post development maintenance of files. - Monitors compliance and evaluates compliance performance at the CTA/ portfolio level during cyclic technical reviews. - Considers post-development compliance of Project Principal Investigators in past performance evaluations of new projects.	- Monitors compliance and evaluates compliance performance at the CTA/ portfolio level during cyclic technical reviews. - Considers post-development compliance of Project Principal Investigators in past performance evaluations of new projects.	- Maintains good software development practices after initial development. - Provides current documentation to the CTA/Portfolio Leader as significant changes develop or after several nominal changes are made to the documentation and code. - Promulgates fixes as appropriate.

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